LYONIA

Occasional Papers of the Harold L. Lyon Arboretum

Volume 2, No. 2 November 1983

A NEW SUBSPECIES OF BIDENS (ASTERACEAE) FROM MAUI

HAROLD ST. JOHN[1], KENNETH M. NAGATA[2], and FRED R. GANDERS[3]

ABSTRACT. Bidens campylotheca ssp. *waihoiensis* St. John is described as new. It is most closely related to *B. c.* ssp. *pentamera* (Sherff) Ganders & Nagata which also occurs on East Maui. The new taxon was considered a hybrid between *B. hillebrandiana* and *B. menziesii* by Gillett, but it is not intermediate between these two species, nor especially closely related to them.

Gillett (1975) illustrated an unusual *Bidens* collected by Betsy Harrison in 1972 in the Waihoi Valley, on East Maui. He regarded this population to be the result of natural hybridization between *B. hillebrandiana* (Drake) Deg. ex Sherff and *B. menziesii* (A. Gray) Sherff. Leaves of the Waihoi plants matched those of the experimental hybrids between the putative parents quite well, although Gillett admitted that the achenes of the Waihoi plants were very different from those of the experimental hybrid. He also pointed out that the habitat occupied by the Waihoi plants, dense rain forest between 800 and 1200 m in altitude, was very different from the strictly coastal habitat of *B. hillebrandiana* and the dry uplands occupied by *B. menziesii,* and not at all intermediate between them. From the photographs in Gillett (1975, Fig. 9) it is also clear that the inflorescence and outer involucral bracts of the Waihoi plants are not at all similar to those of Gillett's experimental hybrid. Examination of specimens of the Waihoi plants shows that they have longer outer involucral bracts, more ray flowers and more disk

[1]Bernice P. Bishop Museum, Honolulu, HI 96818.

[2]Harold L. Lyon Arboretum, 3860 Manoa Road, Honolulu, HI 96822.

[3]Department of Botany, University of British Columbia, Vancouver, British Columbia, Canada V6T 2B1.

Library of Congress Catalog Card Number: 74-620038

Published by the Harold L. Lyon Arboretum, 3860 Manoa Road, Honolulu, Hawaii 96822

Date of Publication of Volume 2(3): 1 November 1983

flowers than either putative parent. The inflorescence of the Waihoi plants is also much more diffuse than either putative parent, with heads on longer peduncles (Table 1). Furthermore, the inflorescences are borne only on lateral branches, while both putative parents produce terminal as well as lateral inflorescences.

It appears that the only character of the Waihoi plants that is possibly intermediate between *Bidens hillebrandiana* and *B. menziesii* is leaf shape. In the course of a monographic revision of Hawaiian species of *Bidens* two of us (Nagata and Ganders) have found leaf shape to be extremely variable within species and often within single populations, and it is usually one of the least reliable taxonomic characters in this group. We conclude that it is virtually impossible that the Waihoi plants are recent hybrids of the parentage proposed by Gillett (1975).

However, the Waihoi Valley plants appear to be identical in all characters except achenes, and their somewhat more finely divided leaves, to *Bidens campylotheca* Schz. Bip. ssp. *pentamera* (Sherff) Ganders & Nagata. *Bidens campylotheca* ssp. *pentamera* is endemic to East Maui, where it has been found only at elevations between 1500 and 1900 m in Koolau Gap, the upper Kipahulu Valley, and the upper part of the Waihoi Valley. Subspecies *pentamera* occurs at higher elevations in the same valley as these new Waihoi Valley plants and is obviously their closest relative. *Bidens campylotheca* ssp. *pentamera* has glabrous, twisted or slightly coiled, wingless, awnless achenes. The achenes of the new subspecies are very different. They are irregular in shape but not usually coiled or much twisted, are longer and wider, with flattened lateral margins or wings which are often undulate, and have a few irregular teeth or even awnlike projections on the margins. They usually have a pair of subapical awns which are often prominently retrosely barbed, and often have marginal setae on the upper part of the achene.

The achenes of the new subspecies are most similar to those of *Bidens cosmoides* (Gray) Sherff, which is endemic to Kaua'i, although they are not enveloped by the subtending receptacular bracts as are the achenes of *B. cosmoides.* The floral morphology of *B. cosmoides* is very different from that of *B. campylotheca,* and there is no indication that the formation of the Waihoi plants has involved hybridization with *B. cosmoides.* It is unlikely that the populations of the new subspecies which occupy mid-elevations in the Waihoi Valley are hybrids of *B. campylotheca* ssp. *pentamera* and some other taxon because a morphologically and geographically suitable putative parent does not seem to exist. In any case the mid-elevation populations in Waihoi Valley are a reasonably uniform self-perpetuating taxon. They are best considered a new subspecies of *B. campylotheca,* obviously closest to ssp. *pentamera,* but possessing achenes very different from any other populations of *B. campylotheca.* The diffuse inflorescence and flower heads are typical of, and unique to, *B. campylotheca* among Hawaiian *Bidens.* This new taxon, *B. campylotheca* ssp. *waihoiensis* St. John is described below and illustrated in Fig. 1.

Bidens campylotheca Schz. Bip. ssp. **waihoiensis** St. John ssp. nov.

FIGURE 1.

Differt a ssp. *campylotheca* et ssp. *pentamera* achaeneis aristatis, rectis, marginibus undulatis, setosis apices versus; foliis bipinnatifidis vel bipinnatis.

Erect woody perennial, 0.7-1.3 m tall, with widely ascending lateral branches, flowering only on lateral branches. Young stems quadrangular. Leaves bipinnatifid to bipinnately compound and tripinnatifid, mostly 50-200(-280) mm long including petiole; leaflets or pinnules 7-13, ligulate, with several divergent lobes or teeth 2-4 mm wide, glabrous, dark green above, paler below, chartaceous, mostly 20-50(-90) mm long and 4-10 mm wide. Inflorescence corymb-like with 12-20 heads, peduncles of heads sparsely pubescent, (25-)60-190 mm long. Heads 20-25 mm in diameter, outer involucral bracts 5-7 mm long. Ray flowers sterile, 6-7, yellow, 9-12 mm long, 3-4 mm wide. Disk flowers 25-32, perfect. Achenes straight or slightly curved, black, the margin strongly undulate, setose near the apex and occasionally below, 12-17 mm long, 1.5-2.0 mm wide; awns (1-)2(-3), 1.0-3.0 mm long.

HOLOTYPE: Hawaiian Islands, East Maui, Waihoi Valley, North Fork of Waihonu Stream, stream bank, with *Dicranopteris, Dubautia, Broussaisia,* elevation 3,100 ft, 23 July 1973, *D. Herbst & B. Harrison 2600* (BISH).

DISTRIBUTION: Waihoi Valley, East Maui, at elevations between 850-1000 m.

SPECIMENS EXAMINED: MAUI: East Maui, Waihoi Valley, south fork of Waihonu Stream, *B. Harrison 101, 102* (BISH). Waihoi Valley, on banks of Waihonu Stream, *K. Nagata et al. 1048* (HLA).

LITERATURE CITED

GILLETT, G. W. 1975. The diversity and history of Polynesian *Bidens* section *Campylotheca*. Univ. of Hawaii, Harold L. Lyon Arboretum Lecture No. **6**: 1-32.

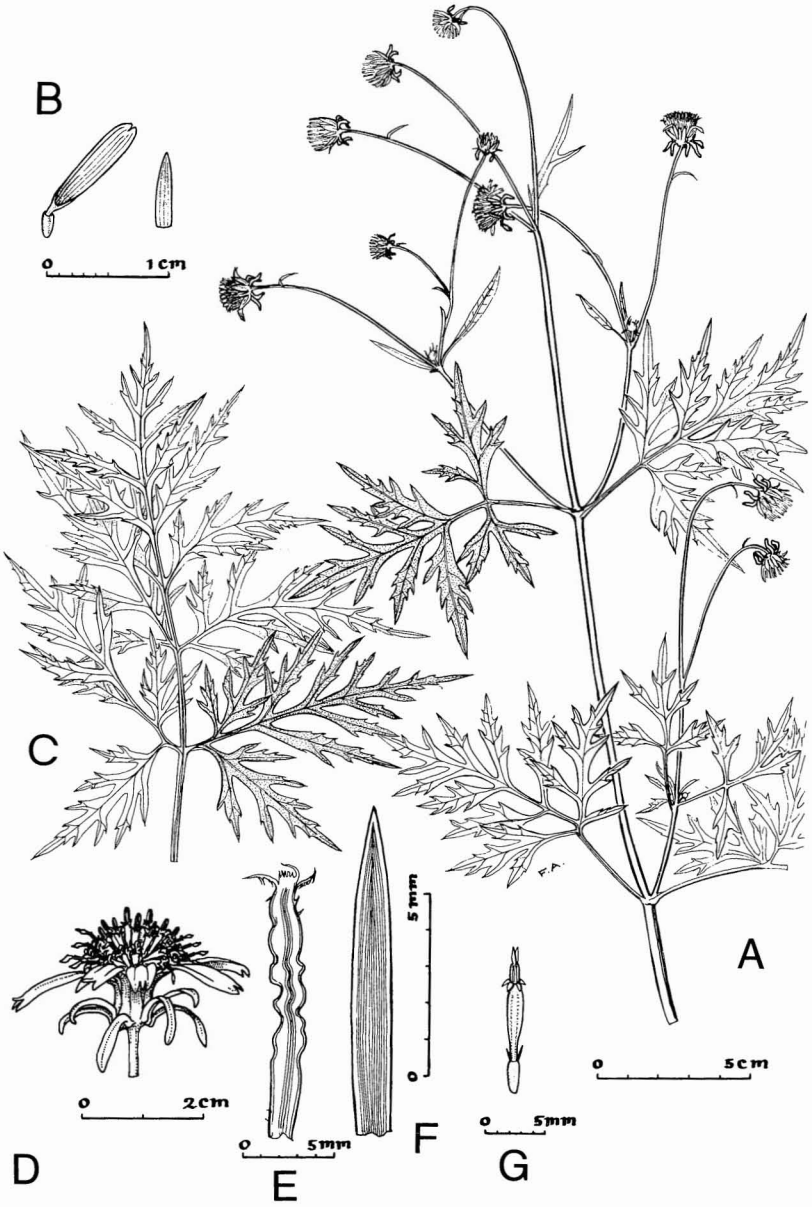

FIGURE 1. *Bidens campylotheca* ssp. *waihoiensis* (A) inflorescence; (B) ray flower, left, and receptacular bract, right; (C) leaf from middle of main stem; (D) capitulum in flower; (E) achene; (F) outer involucral bract; (G) disk flower.

Table 1. Morphological features of *Bidens campylotheca ssp. waihoiensis* and the putative parents postulated by Gillett (1975).

character	*B. hillebrandiana* ssp. *polycephala*	*B. campylotheca* ssp. *waihoiensis*	*B. menziesii* ssp. *menziesii*
peduncle length (mm)	2-7	(25-)60-190	4-22
heads per inflorescence	10-30	10-18(-20)	>50
outer involucral bract length (mm)	2-3	5-7	1-2
ray flower length (mm)	9-12	9-12	15-24
ray flower number	5-6	6-7	5
disk flower number	11-21	25-32	7-8